



State of Utah

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DIVISION OF
OIL, GAS & MINING

January 10, 1991

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MINERALS PROGRAM
FILE COPY

Mr. Ed King
Jumbo Mining Company
6305 Fern Spring Cove
Austin, TX 78730

RE: Jumbo Mining Co. Ground Water Discharge
Permit Application Completeness Review

Dear Mr. King:

We have reviewed Jumbo Mining Company's application for a ground water discharge permit at the Drum Mine. The application was deficient in several areas in that not enough information was supplied to properly process the application and to adequately consider several issues raised by this case.

Information submitted for a ground water discharge permit application should demonstrate that the permitted facilities will not cause degradation of ground water quality beyond the protection levels defined in the regulations. Because newly-constructed leach pads will have a different liner design than the two existing pads, the new pads will have a much lower potential for causing a discharge to ground water. Accordingly, much more information on the site's hydrogeologic characteristics must be obtained to demonstrate that long-term operation of the existing leach pads will not cause degradation of ground water quality, and that a valid monitoring plan can be devised to ensure ground water protection over the lifetime of these pads. It may be advisable to consider using only new leach pads designed according to current best available technology, rather than investing in elaborate studies and monitoring plans to make up for deficiencies in the design of the older pads.

Additional information which is needed for the permit application is described below. Some categories of information requested may not be appropriate or feasible to obtain in this case, and if this occurs, the application should explain why the particular information cannot be presented. I have tried to separate items which would be needed only for permitting of the existing pads from material needed for the rest of the permit.

Detailed Hydrogeologic Report

Information on the site's hydrogeology, which was not supplied in the permit application, is needed for several purposes related to this particular case:

1. Define the ground water flow system(s) at this site, which probably lies above a very deep unsaturated zone, perhaps 1400 feet or greater
2. Define the extent of perched aquifers on the site, at least one of which underlies the proposed new leach pad and has been contaminated by previous mine-related activities. The study should also document the extent and severity of this contamination.
3. Define the relationship of the spring proposed for use as a background ground water sampling point with other bodies of ground water under the site.
4. Locate points which would be appropriate to use for compliance monitoring related to the ground water discharge permit.

In accordance with provisions of the Ground Water Protection Regulations, Jumbo Mining should submit information which would allow for informed decisions to be made regarding issues raised by this permit application. If this study demonstrates that upgradient and downgradient ground water quality monitoring is not a practical option for this site, more stringent design criteria for the leach pad liners may be required to ensure that no discharge takes place.

Information is needed in several related categories.

Geology

Maps and cross-sections should be prepared which show the distribution of the stratigraphic units present at the minesite and which include locations proposed for use as background ground water sampling points and compliance monitoring points. The maps should be at a scale of not more than 1 inch to 200 feet, but vertical scale in the cross-sections may vary as needed. In support of a compliance monitoring plan for the existing pads, these geological maps should also show structural features which may affect ground water flow, such as the locations and orientations of faults and fracture systems, as well as density of fractures and width of individual fractures within a fracture set. The distribution of any alteration which may affect hydrologic properties of the rocks should also be shown. The map should be accompanied with a lithologic description of all geologic units shown on the map.

Hydrology

As part of the design of a compliance monitoring plan for the existing pads, information which gives an estimate of the hydrologic properties of the various geologic units on the site should be presented. Estimates of the percent porosity in the units should be made, and what type(s) of porosity are present, such as primary, secondary, or fracture porosity. Jumbo should also conduct tests to determine the hydraulic conductivity of rock units which may be affected by any potential discharge from the permitted facilities. Methods used to estimate hydraulic conductivities are subject to prior approval by the Bureau of Water Pollution Control.

For the part of the permit covering the new pad, water level measurements in the monitor wells in the area of the perched aquifer should be taken within the same 24-hour period, and calibrated to elevation above mean sea level in order to construct a map of the potentiometric surface of the aquifer.

Hydrogeologic Map and Cross-Sections

A map and cross-sections should be prepared which present information on the site's hydrogeology and ground water flow system(s). The map and cross-section horizontal scale should be the same as that in topographic and geologic maps presented with the application. The hydrogeologic map should show the outcrop, extent, and attitude of stratigraphic units present at the site, and the site's topography, as well as the locations of the following features:

1. The permitted leach pads and related facilities
2. Subsurface excavations which may affect ground water flow or be used for ground water monitoring
3. The locations of proposed monitor wells and representative dry holes which can help define the extent of subsurface water
4. The location of surface water, including seeps and springs
5. The locations of surface drainages
6. Distribution and potentiometric surfaces of perched aquifers, sufficiently detailed to determine the source of the ground water and flow directions
7. Horizontal component of inferred ground water flow in the unsaturated zone
8. Location of proposed compliance monitoring points

The map should also show the horizontal projection of hydrogeologic cross-sections. These cross sections should be oriented relative to the ground water flow direction at the site, one section parallel to the flow and one perpendicular to it. If flow directions in the unsaturated zone are highly variable or cannot be determined, the sections can be oriented relative to the flow direction in the perched aquifer underneath the proposed new leach pad. The cross-sections should show the distribution of stratigraphic units and structural features which may affect ground water flow. They should also show the piezometric surface of perched aquifers and their lower confining units where known, and locations of ground water discharge to the surface (springs). Inferred ground water flow directions in the unsaturated zone should be projected into the planes of the cross-sections.

Hydrogeochemistry

Ground water samples from the perched aquifer(s) should be collected and analyzed to provide geochemical data in support of the description of the ground water flow system. The samples should be taken from the same uppermost aquifer which underlies the leach pads. Sampling locations should be located hydraulically up and downgradient of the pads (where this is applicable). Sampling should be conducted at the points selected for background sampling and compliance monitoring. In the case of the perched aquifer in the vicinity of the proposed new leach pad, additional sampling should be conducted

to determine the extent and severity of cyanide contamination, as requested in our letter of July 2, 1990. Analyses of the samples should include the following parameters:

1. Field measurements: temperature, pH, and specific conductance
2. Major cations: Na, Ca, K, Mg
3. Major anions: bicarbonate, carbonate, sulfate, chloride
4. Total dissolved solids

Samples suspected of being contaminated should also be analyzed for total cyanide and major metals present in the process solution.

Hydrogeologic Description

A description of the features illustrated on the hydrogeologic map and cross-sections and results of the hydrogeochemical analyses should be prepared. This description should include a tabulation of all monitoring wells within one mile radius of the leach pads, listing elevation, total depth, geologic or geophysical logs which identify lithologies or formations encountered, and the well completion schematic or description, including perforated intervals. A tabulation of all springs and seeps within one mile radius of the pads should also be included, giving location, elevation, temperature, yield (reflecting seasonal variations) and geologic source. The report should also tabulate the subsurface excavations requested to be shown on the maps.

The report should include:

1. A description of the facility within the regional ground water flow system(s).
2. A description of the local ground water flow system in the vicinity of the leach pads.
3. A description of the hydrochemical facies encountered in the sample analyses near the site, and their relationship to the local ground water flow system(s).
4. In support of the compliance monitoring plan for the existing pads, a description of the variability of hydraulic conductivity due to heterogeneity and/or anisotropy. Distinct zones of high or low hydraulic conductivity should be identified on the maps and cross-sections, where they affect ground water flow in the vicinity of the pads.

Background Ground Water Quality

Information on background ground water quality is needed initially to determine ground water class and protection levels for the ground water underlying permitted facilities. During operation of the facility, ongoing background ground water monitoring provides a means of assessing the facility's effects on the underlying and downgradient ground water.

Because of differing hydrogeologic conditions under the proposed new leach pad and the two existing pads, information acquired in the studies for the hydrogeologic report should be used to pick appropriate sampling sites to determine background ground water quality. In the case of the proposed new leach pad, the study should determine the extent and source of water contained in the perched aquifer underlying the site. If, based on this information, a location can be found which is hydrologically upgradient of the leach pad site and which has been unaffected by previous mining-related activities, a monitor well should be developed there for background ground water monitoring. For the two existing leach pads, hydrologic studies should determine the relationship of ground water discharged at Busby Spring to ground water at depth which would receive any discharges from the pads. If it cannot be determined that the spring discharges ground water from the same uppermost aquifer that underlies the leach pads, it may not be a suitable background monitoring point.

Monitoring well construction must conform to the EPA RCRA Technical Enforcement Guidance Document, OSWER 9950.1 (1986). Spring improvements or other sampling points must be constructed in a technically sound manner and of materials that are inert and free of the pollutants of concern.

Once background monitoring points are agreed upon, ground water samples from these points should be analyzed for total dissolved solids and the parameters listed in Table 1 of the Ground Water Protection Regulations, as well as total cyanide and any other metals likely to be contained in the leachate solution. Ground water sample collection should meet the requirements of the EPA Guidance Document (referenced above). Analyses should meet the requirements of UAC R448-6-6.3 A(13), and should be done by state-certified laboratories.

To determine a representative background water quality, at least four replicate sample results should be provided, collected from the background sampling point(s) over four consecutive quarters for each parameter mentioned above, in order to calculate the arithmetic mean, standard deviation and variance of these 16 samples.

Ground Water Discharge Control Plan

The purpose of the Discharge Control Plan is to demonstrate that adequate protection of ground water is provided by the proposed discharge control method. For a leach pad which is designed to prevent any release of fluids, such as Jumbo's proposed new leach pad, plans, specifications, and a description of the facility's construction should be submitted to the Bureau of Water Pollution Control. Because leach pads are required to obtain a construction permit from the Bureau before construction may begin, plans submitted in support of the construction permit will satisfy the requirements for a ground water discharge permit application.

It must be demonstrated conclusively that the existing leach pads do not leak before a ground water discharge permit which covers their operation will be issued.

Compliance Monitoring Plan

The compliance monitoring plan should, in a manner consistent with the discharge control method, demonstrate that operation of the facility does not cause ground water contamination in excess of the appropriate protection levels. For the proposed new leach pad, if design and construction are done in a satisfactory manner so that the pad would truly be a no-discharge facility, regular monitoring of the leak detection system would be an adequate compliance monitoring plan. However, the design and site characteristics of the existing pads pose special problems for compliance monitoring. The lack of any aquifers near the surface rules out ground water monitoring. Leak detection methods approved for use in the 60-day test of the pads may not be adequate for detecting small leaks which may result in a large total discharge over the life of the pads. The existence of cyanide-contaminated ground water in association with pads of similar design on the Drum Mine property shows that leaks may also occur during operation of these two existing pads.

With information acquired in the hydrologic report required for this permit, Jumbo Mining should develop site-specific compliance monitoring plans for these two pads. If the plans include vadose zone monitoring, site-specific hydrogeologic information should help determine proper placement of lysimeters or other monitoring instrumentation. If the plans include geophysical monitoring methods, Jumbo Mining should demonstrate to the Executive Secretary's satisfaction that the methods will be useful for detecting leaks alone or in combination with other monitoring methods. The geophysical methods should be sensitive enough to distinguish leaking leachate solution from natural infiltrating water. A baseline survey should be run before sprinkling begins, for comparison with later surveys run for compliance monitoring.

Closure and Post-Closure Plans

Plans should be developed to prevent ground water contamination after the leach pads cease operation, and to monitor any potential discharge as necessary. As part of a comprehensive ground water permit for this site, closure plans should be submitted for all inactive leach pads on the mine property.

Because the exact closure procedures for the three pads covered in this permit will probably not be known until shortly before the actual closure, detailed plans need not be submitted now, but a general plan and closure standards should be included in the permit application. The plan should provide for neutralization of residual cyanide in the pads, stabilization of the pads to support a final cover, design and construction of the final cover, and post-closure monitoring of the site. The plans should also be acceptable to other regulatory agencies having jurisdiction over mining activities, in this case, the U.S. Bureau of Land Management and the Utah Division of Oil, Gas and Mining. Please contact us when you are ready to design these plans for guidance on specific closure criteria.

Mr. Ed King
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Contingency Plan

The contingency plan should outline definitive actions that will be taken to bring the leach pads into compliance with the regulations if a violation occurs. Specific plans should be developed for the new and existing leach pads given the differences in design and compliance monitoring between old and new pads. The permit application mentions stopping sprinkling only on that section of a pad tributary to a leak. If it is Jumbo's intention to follow a plan like this rather than shutting down the entire pad, it should be demonstrated how a leak would be located and what criteria would be used to determine which sections of the pad could be safely operated in the presence of the leak or with repair efforts in progress.


Corrective Action Plan

As part of a comprehensive ground water permit for this site, Jumbo Mining should determine the extent and severity of cyanide contamination in the perched aquifer, as requested in previous correspondence with the Bureau of Water Pollution Control. If contamination exists which is in excess of the ground water quality standards, Jumbo Mining may be required to develop a corrective action plan which may include ground water remediation. The requested information may be included as part of the ground water discharge permit application.

Please revise your application to include the information requested above. If you have any questions about this permit or other options for permitted facilities, please call me at (801) 538-6146. These issues are quite complicated to convey entirely by letter, therefore we recommend a meeting to discuss it more fully at your convenience.

Thank you for keeping us informed about your activities at the mine.

Sincerely,



Mark Novak, E.H. Scientist
Ground Water Protection Section
Bureau of Water Pollution Control

MN:kc/mhf

cc: Wayne Hedberg, Division of Oil, Gas, and Mining
Roger Foisy, Central Utah District Health Dept.

Q:JUMRECOMP.LTR